Advanced TCCS for Spacesuit Applications, Phase I Project

SBIR/STTR Programs | Space Technology Mission Directorate (STMD)

ABSTRACT

A recent trade study showed that active removal of ammonia (NH3) and formaldehyde (CH2O) is crticial to meeting the 24-hr SMAC limits in the advanced space suit designs (Jennings 2009). TDA Research, Inc. (TDA) proposes to develop a new TCCS for the PLSS based on a combination of a regenerable NH3 sorbent and an ambient temperature catalyst that can oxidize formaldehyde into much more benign CO2 to control the concentration of these contaminants in the spacesuit ventilation loop. In Phase I, with the guidance of molecular modeling, we will synthesize several sorbents and evaluate their potential in reversible NH3 removal under representative conditions. We will also evaluate the efficacy of the ambient temperature oxidation catalyst for formaldehyde removal as well as for oxidation of other VOCs. We will demonstrate the regenerable sorbent's operation for a minimum of 5,000 adsorption/regeneration cycles and its catalytic activity for a minimum of 400 hrs (equivalent of 50 8hr EVAs). We will evaluate the impact of bed geometry and potential of using different integration options to the PLSS to ensure that the addition of these new materials will not impact the operation of the swing bed that removes carbon dioxide. We will carry out detailed design of the TCCS and determine its weight/volume to assess the logistics savings against the one-time use NH3/CH2O removal sorbents.

ANTICIPATED BENEFITS

To NASA funded missions:

Potential NASA Commercial Applications: The main attraction of our research to NASA is its ability to provide a lightweight, compact, TCCS for the PLSS. Reducing the weight and volume of the sub-components of the spacesuit is of critical importance to NASA, particularly for next generation planetary exploration missions.

To the commercial space industry:

Potential Non-NASA Commercial Applications: A successful

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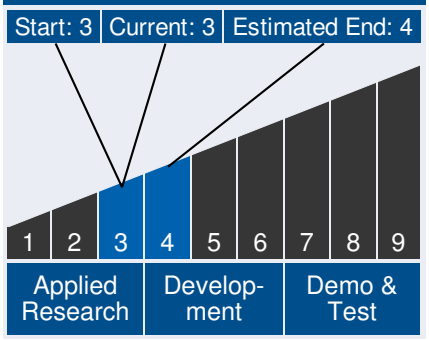
Technology Maturity



Management Team

Program Executives:

- Joseph Grant
- Laguduva Kubendran

Program Manager:

- Carlos Torrez

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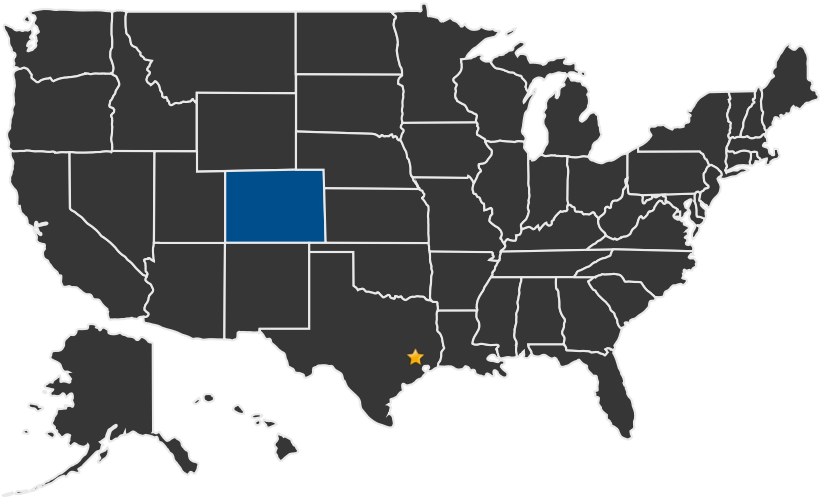
ambient temperature CH2O and VOC oxidation catalyst and NH3 removal sorbent system that can remove harmful contaminants from breathing air will find an immediate use in a range of commercial markets such as fire protection systems and indoor air quality control. In addition, it will also find use as fire recovery units on-board the submarines.

U.S. WORK LOCATIONS AND KEY PARTNERS



U.S. States With Work

Lead Center:
Johnson Space Center

Other Organizations Performing Work:

- TDA Research, Inc. (Wheat Ridge, CO)

PROJECT LIBRARY

Presentations

- Briefing Chart
  - (http://techport.nasa.gov:80/file/23392)

Management Team *(cont.)*

Principal Investigator:

- Gokhan Alptekin

Technology Areas

Primary Technology Area:
Human Health, Life Support, and Habitation Systems (TA 6)
└ Extravehicular Activity Systems (TA 6.2)
  └ Portable Life Support System (TA 6.2.2)

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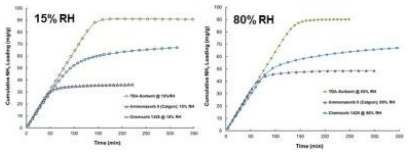
IMAGE GALLERY



Advanced TCCS for Spacesuit Applications, Phase I

DETAILS FOR TECHNOLOGY 1

Technology Title

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Potential Applications

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